

Abstract Submitted  
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**Biphase, Scale Interactions, and the Turbulent Energy Cascade<sup>1</sup>**

GUANGYAO CUI, IAN JACOBI, Technion — The phase of the bispectrum of a turbulent velocity signal is used to relate the geometry and energetics of interactions between large- and small-scale motions in wall-bounded turbulence. Because the normalized bispectrum naturally describes non-linear, triadic interactions, it is ideally suited for measuring the coupling between the different scales of motion in turbulence, without the use of filtering procedures. Its corresponding biphase represents the spatial delay between triadic scales imposed by convective coupling, and is shown to relate directly to the amplitude modulation coefficient used in previous studies of scale interactions. The biphase also indicates the direction of the turbulent, streamwise energy cascade between the interacting scales. The bispectrum and biphase are calculated from experimental measurements in a turbulent boundary layer and used to provide a unified energetic and geometric interpretation to the phase lag between large- and small-scales previously measured by correlation techniques.

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